PUBLIC HEALTH

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No. 12. Vol. LXVI SEPTEMBER, 1953

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EDITORIAL

Public Health Inspectors

Just over two years ago the Working Party set up by the then Minister of Health, Mr. Marquand, " to enquire into the nature of the work at present being done by sanitary inspectors and the nature and functioning of the present arrangements for their recruitment, training and qualification, and to report on the adequacy of such arrangements," held its first meeting. Thereafter it received written and oral evidence from 24 bodies, written evidence only from 10 bodies and individuals, and oral evidence only from five others. The two sanitary inspector members have visited 103 local authorities of all types and all the members have visited the S.I. examinations. Lastly, the Working Party, which consisted of only six members, including the chairman, Sir John Maude, has had the advice of a Steering Committee of 17 representatives of Government departments and associations, though, as the report now issued* is that of the Working Party only, we are a little vague as to the actual part played by the Committee.

The results of the Working Party's labours are impressive and the report seems to us a model for similar enquiries. The factual information obtained (by carefully devised questionnaires) about the present-day work of the S.I. reveals how far it has progressed not only since the pre-1872 days of the Inspector of Nuisances, but even in recent years—just as much indeed as has that of the Medical Officer. The type of entrant to the office of S.I. has likewise changed, so that of those qualifying between 1946 and 1951, 71% had matriculated or held the School Certificate ; recruitment is now increasingly from grammar school boys doing clerical work for local authorities. For the future the G.C.E., with passes in four subjects, is recommended as the standard of preliminary education required. The altered nature of the S.I.s is also recommended to be given recognition by the new title which we have placed at the head of this comment.

The most drastic recommendations, as to the examination and the examining body, are likely to cause mixed feelings in some quarters. The Society in its evidence urged a basic examination comprising the standard in inspection of meat and foods which now requires the additional certificate granted by the R.S.I. This point has been adopted by the Working Party, which recommends a comprehensive training of four years, followed by one examination to be conducted by a new body to be known as the Public Health Inspectors Education Board, on which the inspectors themselves would have an enlarged representation (10 out of 24 instead of two out of 30 on the present R.S.I. and S.I. Examination Joint Board). The recommendation that the Society of M.O.H. should retain three direct representatives on the new Board and the several references to the " general direction " exercised by the M.O.H. over the work of his colleague the Public Health Inspector will, we hope, allay the doubts which have been fomented on the continuation of the existing relationship. But perhaps this matter will now be clarified by a new version of the Sanitary Officers Regulations.

This report should be closely studied by all concerned with the efficiency and welfare of the health department's personnel. Incidentally, the wording of the whole report is a model of lucidity (note the way in which the short opening chapter describes the developmental period of the public health service in Britain) ; for this good writing we presume that Mr. W. A. Fuller, the secretary, is the man to whom the credit should be given.

* Report of the Working Party on the Recruitment, Training and Qualification of Sanitary Inspectors. (Pp. 145. Price 4s. 6d. net.) London : H.M. Stationery Office. 1953.

The Society of Medical Officers of Health

Formal notice has been sent by post to every member of the Society of the holding of an Extraordinary Meeting on Thursday, September 17th, at 5 p.m., at the London School of Hygiene and Tropical Medicine, when the following special resolution will be submitted :—

> That the name of the Association be changed from " The Society of Medical Officers of Health " to " The Society of Preventive Medicine," and that the Articles of Association of the Company be amended accordingly.

An Ordinary Meeting will follow at 5.30 p.m., when the new President, Dr. Charles Metcalfe Brown, will be installed and deliver his address.

At 6.30 p.m. there will be a cocktail party. Members who wish to attend the latter are asked to inform the Administrative Officer by September 8th.

PROBING THE MYSTERIES OF HEALTH *

By JOHN MADDISON, M.D., D.P.H.
Medical Officer of Health, Borough of Twickenham

Differences in People

During 1952 I was asked to help in an investigation by the National Foundation for Educational Research on why it is that some boys and girls who pass the examination at 11 plus for entrance to a grammar school fail to make the progress expected of them, or sometimes even deteriorate ; and, conversely, why some children who fail to pass and go to modern schools, are found at the top of their classes and so, presumably, would have done well had they been sent to a grammar school. This question is part of a wider one which has to do with the problem of varying rates of maturation of abilities and personality. And still wider : why are we all different, and what are the basic differences ? We are different in shape and size, in features and colour, in character and intelligence, in sociability and determination. We vary, too, in our health, in our ability to withstand infection, in the readiness with which we get heart disease or cancer or other ailments, and in the onset of degeneration in old age.

Year after year my department, in common with other health departments throughout the country, collects information in the school health service showing that out of so many children examined each year in the periodic inspections in schools a fair proportion are always found who have poor physique, skin diseases, eye defects, diseases of the ear, tonsils and adenoids, heart diseases, lung diseases, various deformities, and others with a miscellaneous assortment of ailments. And in addition to these a great many children turn up in the clinics sent either by their parents or teachers with other complaints.

The Influence of Home

It has long been known that the influence of a child's home is of enormous importance. In 1951 we tried to grade the homes of the children examined in the periodic medical inspections in schools according to a classification of three grades—good, average and bad. The information was based on the health visitors' knowledge of the children's homes. We used coding sheets and recorded also the height and weight of each child, his position in the family—first, second or third, etc. To record the ailments and defects more accurately we used the International Classification of Diseases[1], where each disease is listed and given a code number. There were about 7,000 children altogether ; the particulars of each were punched on cards for use on punch-card machines and we made various tables which classified the children in a number of ways. The tables showed that those who came from poor homes had more defects, suffered more from ill-health, were less in stature and weight than the children from better homes. Probability tests applied to the tables showed that it was unlikely that these results had arisen by chance. With due allowance for all the imperfections of experiment, we found support for the hypothesis that the state of a child's home has a profound influence on the health of the child. We then considered what was meant by a bad home.

Bad Homes

A bad home is not one caused by mere lack of money and possessions, although this can be a contributory cause. A bad home usually has some of the following characteristics : low family income causing insufficient food, clothing, footwear and material needs ; an untidy, dirty or squalid house ; restricted living space with overcrowding due to a large family or the presence of relatives, lodgers, or another family ; a broken home with one parent dead, or divorced, separated, abandoned, deserted or imprisoned ; an unmarried mother ; or a parent suffering from a long physical or mental illness, especially in hospital. There may be a bad marital relationship with frequent and severe quarrelling ; or drunkenness ; and one or both parents not carrying their fair share of responsibility. The attitude of one or both parents to the child may lack interest ; there may be too little or too much discipline ; or harshness, neglect, or cruelty with frequent corporal punishment ; or mental torment by derogatory and insulting expressions to the child, a hostile attitude, absence of love and security, or jealousy ; or, alternatively, over-indulgence, spoiling, inconsistent treatment as from violent oscillations of love and hate. The child may also be easily influenced by bad companions, changes of school ; or the child's inability to obtain help with some problem which he believes important.

Classifying Homes

As the investigation proceeded it became clear that in order to determine the relative importance of these deleterious influences on the health, welfare and education of children, we must have a much finer classification of homes and the people in them ; and some sort of a measure. So for the year 1952 sections were added to the coding sheets dealing with the dwelling, the occupants, mother's personality, care in the home, and influences outside the home. The dwelling section contained details of the type of house, the accommodation, the age of the property, whether owner-occupied or rented, the state of the internal decorations, the general state of repair, what type of water supply, the method of providing hot water, the quantity and quality of household effects, the cleanliness and the tidiness or otherwise. The occupants listed father and mother with their occupations, the number of children in the family and their ages, and other persons resident with the family, such as the maid, lodgers or guests. All these items are easily recorded ; the assessment of the personality of the mother or father is much more difficult.

Assessing Personality

Most of us every day of our lives are making observations on our friends and acquaintances and in doing so we mentally classify them, however roughly it may be. Raymond Cattell[2] has published a book on personality, and I consulted it for help in assessing the personality of parents and children. He gives a list of 16 personality factors which are the result of factor analyses carried out in his laboratory. He claims these are the basic or source traits of personality, the result partly of hereditary endowment and partly of environmental influence. The factors are listed in order of importance, so I took the first six as representing perhaps as much as any health visitor could assess, and made a rating scale with three grades, high, average and low, on the first six of Cattell's personality factors for the assessment of the mother's personality. Cattell[3] has also published a written test, but although it was tried out it proved unsuitable for routine use because of its length and partly because of its difficulty. The six personality factors chosen were : friendliness, intelligence, steadiness of emotions, submissiveness, cheerfulness and conscientiousness. In his personality test Cattell gives a guide as to the sort of responses most people give to questions and in conversation on various topics ; these responses indicate the degree each personality factor can be assessed at. These responses were set out as a guide to the health visitors when interviewing mothers.

The section dealing with care in the home contained four items—the broken home, the harmony in the home, social standards and security. Each of these items also has three grades : good, average and bad. The broken home is one in which one or both parents are unable to take a proper share in the child's upbringing. Common causes are : mother unmarried ; one parent dead, divorced, separated, deserted or imprisoned, etc. Where the home is lacking in harmony, the common causes are : husband or wife being critical of each other, especially in front of the children, or quarrelling, or mistrust ; drunkenness ; one or both parents not taking a proper share of responsibility. Where

* Presidential Address to the Home Counties Branch, Society of M.O.H., London, March 6th, 1953.

the home has poor social standards, the common causes are a poor discrimination of right from wrong ; lack of sense of duty as a neighbour or citizen ; poor standards of conduct ; and indifference to health, cleanliness, clothing, education, interests, hobbies and religion.

The last section of the coding form dealt with influences outside the home. These also were divided into three grades : good, average and bad. The bad ones are those where the child mixes with undesirable companions ; or has an unsatisfactory relationship with his teacher ; or with possibly long absences from home ; or several changes of school. The child may be unable to deal with some problem which he believes to be important.

The information being collected about each child is summarised in the following list :—

School attended—about 60 departments in Twickenham, Feltham, Sunbury and Staines.
The examining medical officer.
The child's date of birth.
Periodic group—entrant, junior, senior.
Place in family and the total number of children in the family.
Whether parent was present or not at the examination.
The general condition of the child.
The first most important defect coded in the International Code.
The second defect coded in the 10M Code of the Ministry of Education.
The third defect coded in the 10M Code of the Ministry of Education.
The height of the child.
The weight of the child.
The type of house lived in—10 types.
The accommodation in the house—26 codeable items.
Age of property—four periods.
Whether owner-occupied or rented.
Internal decorations—three grades.
General state of repair—three grades.
Water supply from main inside or from outside.
Method of supplying hot water—five items.
Household effects, quantity—three grades.
Household effects, quality—three grades.
Cleanliness—three grades.
Tidiness—three grades.
The occupants :
  Father's occupation—five grades.
  Mother's occupation and hours worked—four grades.
  Children in the family, with ages.
  Other people living with the family.
The mother's personality :
  Friendly or distant—three grades.
  Intelligent or dull—three grades.
  Emotional control—three grades.
  Submissive or dominant—three grades.
  Cheerful or depressed—three grades.
  Persevering, conscientious—three grades.
Care in the home :
  The unbroken home or the broken home—three grades.
  Harmony or disharmony—three grades.
  Social standards—three grades.
  Security—three grades.
Outside the home :
  Good or bad external relationships—three grades.

We are collecting information on about one-tenth of the children examined in the periodic inspections in the schools each year, which in this area will give about 750 cases per year.

We are hoping it may be possible to obtain some details about each child's educational progress and intelligence, possibly in the group of junior leavers. Cattell[4] has published a test called "The Junior Personality Quiz." It has not yet been tried out here because the norms and tables are not yet available, but he claims that with this test it is possible to assess intelligence and personality in children.

Factor Analysis

When we have collected all this information the next question is what to do about analysing the data. We might do a factor analysis. Factor analysis is a method which we use to try to disentangle the effects of multiple influences. Thus when many influences are affecting a situation we try to discover which are the common influences producing a certain result. The factors obtained from a factor analysis are only mathematical concepts and may have no existence in reality. The method is full of difficulties. We have the difficulty of the errors in recording the original observations made by different people. There is also a fundamental mathematical difficulty, because in factor analysis a number of influences may not only have a common part which is revealed in a factor, but each influence has a specific part of its own, and these specific influences are mostly neglected in the mathematical technique. We must be very careful how we interpret the results of a factor analysis and not be too optimistic or place too great a reliance on what we supposedly discover.

The Sampling Theory of Godfrey Thomson

Thomson[5] has doubts about the factor theory because of the mathematical difficulties which are always encountered when working out factors. Instead, he thinks that the mind works as if it were composed of a multitude of what he calls bonds, or perhaps brain cells—each cell working on the all-or-none principle as we believe happens in a neural arch. Any ability, such as answering questions in an intelligence test, or writing an essay, or doing a sum, or carrying on a conversation, is supposed to require the services of a certain number of bonds but not all. Thus, for instance, if the brain has, say, 1,000,000 cells, it could be that the ability to speak fluently requires the activity of, say, 50,000 ; the ability to write well might take 100,000 ; the ability to act steadily in a crisis, say, 75,000 ; the ability to solve a difficult problem, say, 500,000, and so on. Different abilities would call for the services of different groups of cells, and indeed almost from minute to minute various combinations of cells would be in activity and constantly changing. Thomson thinks that a mental test calls upon a certain proportion of the cell activities ; that is, it takes a sample of all the thousands of combinations which are possible. He goes on to say that the laws of chance alone will provide an explanation of the possibility of reducing the number of factors of the mind to a few—indeed, to one—if the tests were pure.

The Meaning of Health

It occurred to me that one or other of these theories might provide a working hypothesis to help us to understand the meaning of health. Suppose we make tests—anthropometrical, clinical, physiological, laboratory, mental or social—of a large number of the population, for example by measuring height and weight and other bodily measurements, making clinical observations for the presence or absence of defects or diseases, together with an ascertainment of nutrition ; tests such as running, skipping, jumping, climbing ropes, hanging on a bar, strength of grip, rate of respiration, etc. ; blood sugar curve, digestive function tests, haemoglobin assessment, blood cell count, etc. ; various mental and educational attainment tests ; and observations on behaviour, conscientiousness, reliability, etc. ; and social observations such as the type of house the person lives in, the money income, the quantity and quality of the food, the level of care given to a child. With all these we would have a large rectangular table giving the persons down one side and the scores in columns across the table. We could then do a factor analysis and see if all these observations could be reduced to a few factors. It is possible that we might reach the conclusion that health is made up of so much of a general factor composed of soundness of hereditary stock, excellence of nurture during infancy and childhood, correct feeding, intelligence of parents, soundness of home and knowledge of parents in the upbringing of children. Then we might find another factor which might have to do with the ability to withstand infection and which may be dependent partly on heredity and feeding, and partly on the opportunity the person has had, by minimal infections, to acquire immunity to the common infections. We might possibly find a third, fourth, fifth and other factors which have to do with the

social status and money income of the family ; the type of school the child attended and the intelligence and personality of the individual. All these are merely guesses and as far as I know have not been worked out.

Whenever a patient presents himself with some ailment, you might say that Nature herself has applied a test and that this patient is showing the score or result of that test. It is as if you had put the patient into the laboratory comprising his whole environment and had given him, say, some organisms to inhale or some abnormal physiological stress to withstand. The degree to which his mechanism for countering the effects of this infection or strain has responded might appear as so much "general" factor of health—or lack of it. Just as when an intelligence test is given to a child the result would appear as so much or so little of the general factor of intelligence.

If, however, we look at the matter in the light of Thomson's theory, we would say that each person has countless body and mental functions and that when we apply any "test" we merely draw on a sample of these multitudes of functions. In doing so, however, we can use the sample in the same way as we can use samples in other statistical procedures so as to give us some idea of the unknown domain —the unknown population of physiological functions which comprise the totality of our whole being. Applying Thomson's theory to the situation in the periodic medical inspections in schools we would have in mind something like this. Here is a child whose parents are of a certain social level and with a certain endowment of intelligence, personality, education and social standards. The child will have inherited the genetic make-up of his ancestors and from observations of his parents his endowment of mental and physiological functions is likely to be something like theirs, but more probably nearer the average of the population. Any observations or tests we make on him will be a sample of the multiplicity of influences which have affected him through infancy and childhood, such for instance as that his measurements might be a reflection of the food he has eaten ; any defects or diseases a reflection of the care or negligence or ignorance of his parents and others, or of how he has responded to minimal infections ; his manners, deportment, speech, and educational level will be a reflection of his social status, the companions he plays with and the school he attends, and all the time we are examining him we can regard him statistically as a sample of all these influences.

Whichever way you look at it, either on the theory of factors, or on Thomson's theory of the sample of innumerable bonds, we as health officers should be thinking about and searching for the causes of and the means of mitigating or preventing the detrimental influences. I think as yet we are only dimly aware of the quantitative effect of the various hereditary and environmental influences to which every one of us is subject. I hope we may be encouraged to go on searching for more exact techniques of assessments in health.

If we regard ourselves as research scientists, part of our job is to try to unravel the mysteries of Nature ; the field can only be conquered by attacking a bit at a time, and we cannot hope to cover the whole domain at once. Nor must we expect to find simple answers ; Nature is not simple, and it is the exception rather than the rule to find a simple linear relationship between two characteristics or variables. We can only proceed cautiously, keeping a mind as open as possible ; we can try to find methods of measuring the things we are talking about, recognising the crudeness of our tools, and be humble in proclaiming advances.

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[1] World Health Organisation. (1948.) Manual of the International Statistical Classification of Diseases, Injuries, and Causes of Death. H.M. Stationery Office.

[2] CATTELL, R. B. (1952.) "Personality." New York : McGraw Hill.

(Continued at foot of next column)

PROGRESS OF PUBLIC HEALTH IN LONDON*

By ANDREW J. SHINNIE, O.B.E., M.D., D.P.H.

Medical Officer of Health, City of Westminster

I felt rather diffident when our Honorary Secretary suggested the progress of public health as a subject for this talk. You have heard so many masters in this sphere, like Sir Arthur MacNalty, and the late Sir George Newman and Sir Arthur Newsholme, scholarly and erudite men, all of whom have illuminated the portraits of the pioneers from Hippocrates to Galen, Linacre, Harvey Sydenham, Jenner, Pasteur, and Lister. I felt rather that we had better have a "conversation piece," in which we could all join, if I merely mentioned some of the changes that had taken place in London in my time, *i.e.*, during the past 40 years.

Then, as now, the Metropolitan Medical Officer of Health was concerned with the public health. The present terminology which classifies certain services as environmental and others as personal is misleading. The former term takes no account of persons suffering from infectious disease, control of food and drugs, investigations of infections related to food. Thanks to our adoption of this term, local authorities may reasonably imagine that we are now mainly concerned with dampness and overcrowding in dwellings, lack of ventilation and cleanliness where people work, and the state and adequacy of W.C.s, smoky chimneys and bad drains in all sorts of places.

The Control of Infectious Disease

The prevention and investigation of infectious disease was the reason for the appointment of the pioneers of our profession, William Duncan and John Simon, and these duties remain the all-important and primary concern of the Medical Officer of Health. By the time I entered public health, scarlet fever in this country had become of less importance but I have known medical officers who had been in charge of isolation wards filled with scarlet fever cases, some of which were of a malignant and fatal type. Only last week I heard from a friend, the Medical Officer of Health to a district in Western Canada, that scarlet fever was very prevalent in that wide area of scanty population with a considerable proportion of dangerous cases. My predecessor told with some gusto of a doctor who, in a horse cab, accompanied by a scarlet fever patient whom he wished to notify, proceeded to the Town Hall to obtain the proper form. The doctor was rewarded by being summoned for being in charge of a patient suffering from a dangerous infectious disease in a public conveyance. Some of our predecessors were inclined to be dogmatic about the conveyance of infection.

Now, when the whole science of immunology has become so abstruse and complicated, we realise how little we know about the transmission of infective agents. Forty years ago the carrier problem was beginning to be elucidated. Until then you were either infected and infectious or healthy and innocent. It is becoming apparent that an individual to all appearances fit and healthy may from time to time be a carrier of a variety of pathogenic strains and now by reason of immunisation an individual may be the distributor of virulent diphtheria bacteria with considerable risk to insufficiently immunised colleagues or associates.

Forty years ago we were basking in the glow of Von Bergman's great life-saving discovery. The anti-toxin

*An address to members of the Metropolitan Branch, Society of M.O.H., Friday April 10th, 1953, at the London School of Hygiene and Tropical Medicine.

[3] ———. (1950.) 16 Personality Factor Test. Champaign, Illinois : Institute for Personality and Ability Testing.

[4] ———. (1953.) Junior Personality Quiz. Ibid.

[5] THOMSON, GODFREY H. (1951.) "The Factorial Analysis of Human Ability." London : University of London Press.

serum had removed so much of the terrors from the scourge of childhood that we were well content. We did not dream then that an instrument would be devised to prevent even the clinical manifestations of this infection. But I am told that there is some new evidence that an imported strain of diphtheria does not take due cognisance of our immunisation methods and that patients under the influence of radium treatment for malignant disease of the upper air-passages are particularly liable to this resistant strain. Is there any finality to the uncertainties of the immune state? As we meet with the strains of coccal organisms resistant to the sulpha drugs and even to the antibiotics, we seem to be penetrating still further into a dark forest. But let us take courage when we think of the resounding victories won against the puerperal infections and of those who would not be living to-day were it not for penicillin.

Smallpox

In smallpox, vaccination was our sure shield. The diagnosis was sharply defined, or so it seemed. Now the issue is by no means unequivocal. When the distinguished Cameron or Wanklyn pronounced a diagnosis there was no more to be said: in my experience, I have never known their diagnosis amended or reversed. Their affirmations gave one a feeling of tremendous confidence. May it not be that the present practice of attenuated vaccination obscures the picture? Modified and indefinite cases mostly from abroad have within the past few years caused outbreaks of high mortality through lack of recognition?

I cannot help feeling that the smallpox organisation of the past was very efficient and created confidence. There was, for instance, the observation hospital at Rotherhithe, where patients were kept sometimes for two to three days before being transferred to the large smallpox hospitals or discharged home as innocent. Now we set less store by the didactic teaching of Rickets and Byles and wait for the report of the virus expert. May it not be that in so doing we are in danger of losing our powers of clinical observation as seems the tendency in other spheres of medicine? The outbreaks at Glasgow and Brighton seemed to indicate the stress to which the new Regional Hospital Board was put. It is said that in one of those incidents a regional pediatrician was called in to pronounce upon the strange rash that afflicted the patient. Whatever the circumstances, it did appear that the new organisation was oblivious of the role that the Medical Officer of Health has by tradition always played when smallpox is suspected.

Poliomyelitis

Before I leave infectious disease let me mention poliomyelitis. It is sometimes stated that man, like Alexander, has no fields left to conquer in infectious disease, but a few years ago to keep us in due humility we were sent poliomyelitis. Few would be bold enough to say that we know more about the transmission of poliomyelitis than our ancestors did about plague and typhus in the middle ages. It has come among us from time to time as a disabling and death-dealing menace. In the early years of the present century we saw it in children's hospitals as a not very common cause of infirmity in children.

Infant Mortality

I mentioned earlier the astounding reduction in childbed illness and mortality with the introduction of the sulpha drugs and antibiotics. Let me also recall the equally welcome reduction in infant mortality during the present half-century. In 1911 there was a veritable massacre of the innocents. Infantile diarrhoea was accepted as inevitable in a torrid season such as we experienced that year, and we watched those infants die with almost undisguised fatalism. To my mind, among the many factors which have helped to reduce this menace to small importance, none stands out with greater prominence than the introduction of the prepared dried milk.

Milk

Milk has been the subject of much legislation, but we cannot ignore the progressive measures taken by the trade itself in the production and delivery of clean milk—the large combines with the elaborate plant to ensure that end. Gone are the days when milk in churns was hawked about the streets and formalin or salicylic acid sometimes added to prevent the evidence of decomposition. Cream was a favourite subject for litigation: was the addition of boric acid harmful and to what extent? It was not prohibited till 1928. Teams of expert witnesses used to be brought to court to testify one way or the other. Cases were won or lost, some even reaching the High Court. I am not sure that anyone was ever really harmed by consuming traces of boric acid but it was right to fight for the principle that a natural animal product like cream should be free from agents intended to disguise its true condition.

Food and Drugs

The administration of the Sale of Food and Drugs Act was in a sense straightforward. The articles on which standards were imposed could be numbered on the fingers of one hand. Now the articles of food and drink, subject to standards of quality and ingredients, are very numerous and the law as regards labelling and designations is so extensive and precise as to merit special study. Food poisoning, once misnamed ptomaine poisoning, was an uncommon occurrence before the first world war, or if it did happen it did not come to the notice of the Medical Officer of Health unless the outbreak was extensive and with marked mortality. Now, since notification was introduced in 1938, including suspected cases, it has become a constant study in epidemiology. Bacteriological services are readily available, and immediate researches are initiated on the sufferers, the suspected food and the transmitting agent.

Section 13 of the Food and Drugs Act, and the more recent food by-laws, have given wider authority for more specific supervision over food premises to an extent unimagined many years ago when food premises had to be indescribably foul before a court could be convinced of an offence under nuisance law. While the quality and standards of food should now give cause for satisfaction, the presence of improving substances in a number of articles, such as bread, though officially approved, cause some uneasiness in the minds of many consumers. The methods of handling food has still some way to go before public health authorities can feel completely happy.

Housing

The tendency of the Housing Acts since 1909 has been to give the Medical Officer of Health much more concern in this sphere of operations of local authorities. The marked shortage of housing revealed at the end of the first world war stimulated, nay panicked, the Government into the Addison scheme which, though logically conceived, proved unduly extravagant. It was not bombing that had created the shortage but the steady increase of the population, coupled with the fact that for some years the speculative builder, frightened by the policy of Lloyd George as Chancellor, *e.g.*, proposed taxation of land values, had ceased to make his contribution of small houses prior to 1914. Rising costs of land had likewise discouraged the Trusts, *e.g.*, Peabody, from embarking on new schemes in any degree commensurate with the urgent need.

Then during the 20 years between the wars successive Governments encouraged the local authorities to become landlords by loans and subsidies from the Exchequer, the degree of generosity depending on the economic outlook of the Government of the day. This tremendous programme of new construction naturally drew attention to the need for clearance and closure of unfit dwellings with the development of cleared sites on good town-planning lines. The Medical Officer of Health has thus been able to play an intimate and important part in this great drive

for housing improvement in which he had hitherto played a relatively insignificant part. Local authorities were to become the new landlords of housing estates. But if there were slum landlords who in the past tried to get the most out of their property without putting anything in they have certainly fallen on hard times nowadays. The Medical Officer of Health presses both good and bad owners to undertake repairs which may often far outrun in cost the meagre rent which the law still permits. Such owners, however well intentioned, are fighting a losing battle. I have heard of some trying to give away their properties to the local authorities, which have no use for them.

Atmospheric Pollution

One can only refer very briefly to further items of change in the aspects of public health in London : the problem of atmospheric pollution has been receiving much more attention since the end of the second world war. In the previous decades many local authorities, some of them in London, viewed this matter with some detachment, others with complete lack of enthusiasm. But the suggestions that air laden with the products of combustion may contribute to malignant disease of the respiratory tract and that tobacco smoking may likewise be under suspicion, have done much to awaken the public conscience to this accompaniment of urban civilisation. The fog of 1952 has certainly given a jolt to those who were complacent and the " cranks " of 20-odd years ago may now be exalted as seers and wise men. The advent of so many power stations has become a matter of national concern. Not long ago there was a pronouncement to the effect that while the untreated effluent of power stations might be prejudicial to amenities, those in authority were not impressed that health considerations were of importance. These remarks were made before the high mortality from the December fog came to light. It is hoped that the authorities have since been impressed and that active measures will be studied to save the citizen from being stifled while the advantages of electricity are provided for all. We in London have much to learn from other cities in the country, especially in the North, where atmospheric pollution has been taken seriously for many years and this is a sphere in which the Medical Officer of Health is taking a more active interest. It would be gratifying if this aspect of public health in London so long treated with some indifference could arouse more active concern and the local authorities would naturally look to the Medical Officers of Health for inspiration.

Old People

How is it that the problem of old people has become so constant and so distressing ? Can it be that all humanity has developed a more tender conscience as to their fate and welfare ? When we were house surgeons the problems of the aged with fractured thighs, the partially paralysed and other chronic cases were in due course removed from our responsibility by the ever-ready Relieving Officer. We did not realise, perhaps, the atmosphere of the institution to which they were transferred and the prison-like surroundings in which they would end their days. Before the recent war to a Medical Officer of Health the problem of the aged in their own homes appeared only occasionally. Fortunately, the painful procedure of compulsory removal is exceedingly rare. In fact, now the difficulty is reversed. The aged are generally anxious to be admitted to hospital when seriously ill, while the difficulty of obtaining admission is well nigh insuperable. The waiting lists are so long, but death is always waiting to solve their anxieties. This is a public health problem of growing magnitude. The numbers of such cases before the war were negligible. Our lists have mounted from 94 in 1946 to 250 in 1952. Prior to 1948 the Relieving Officer unobtrusively solved many of these difficulties. He knew their cases intimately, their friends, relatives and history, had them admitted to hospital, and, if they died, arranged their affairs and their burial. With the advent of the new arrangements some of his duties have been placed, and others thrust, on the health departments. It is a strange commentary on the elaborate planning of the Welfare State that the new organisation should have displaced in this respect what long years of experience had proved to be of the greatest comfort and benefit to the old and helpless—the understanding care of the humane Relieving Officer.

Conclusion

In these few discursive remarks I have touched on the changing scene in public health in London in the past 30 years or so. The future of the service must necessarily be bound up in any changes in the whole character of local government and its boundaries. Some one has made the suggestion that, as the hospital services, apart from the teaching hospitals, have ceased to be an integral part of the public health service of the larger local authorities, it might be expedient to transfer all the public health services to the control of the hospital boards. The preventive side would then again be married up with the clinical side. The local authorities, apart from the school medical service, would have no public health functions. Areas would have to be redefined but the Medical Officer of Health and his staff and all the services which he controlled would operate from a base within the principal hospital administration of the district. Some such schemes have existed in certain colonial territories but whether it could be suitably imposed on a country nurtured in the traditions of local government based on a democratic electorate is a matter for conjecture. The National Health Service Act paid but lip service to the preventive side of medicine. If an idea such as this became the means of consolidating and enhancing the purpose and prestige of the Public Health Service it might attract recruits who at present appear to be directing their gaze to the glittering prizes to be found in the clinical field.

As we go to press we have learned with regret of the death on August 18th, aged 72, of Brigadier G. S. Parkinson, C.B.E., D.S.O., R.A.M.C. (ret.), formerly assistant dean (and for a time acting dean) of the London School of Hygiene and Tropical Medicine. An obituary notice will appear in our next issue.

DENTAL OFFICERS' GROUP

A meeting of the group will be held at B.M.A. House on Saturday, October 24th, at 2.30 p.m., when Miss Jean Forrest, L.D.S., of the Ministry of Health, will speak on " The Fluoridation of Water Supplies."

All members of the Society with an interest in this subject are invited to attend.

MATERNITY AND CHILD WELFARE GROUP

The first meeting of the session 1953-54 will take the form of a cocktail party at the Board Room, London School of Hygiene and Tropical Medicine, on Friday, October 2nd, at 6.30 p.m. At 7.45 the new President of the Group (Dr. Mary Fisher) will be installed. A gavel is to be presented by Dr. E. V. Saunders-Jacobs, and there will be a short entertainment by Mr. Harry Locke. Tickets (price 7s. 6d.) can be obtained from the Administrative Officer.

A Postgraduate Week-end will be held in London on October 3rd and 4th. Applications should be made to the Hon. Secretary (Dr. D. A. Craigmile, 52, Mount Park Road, London, W.5) by September 24th. Registration fee one guinea.

Public Health will be produced in future on a schedule which should ensure its receipt by all readers on or about the 7th of each month. It will greatly assist the economics of the journal if official advertisements of appointments to public health departments, where the closing dates for applications are appropriate, can be sent for publication. The rates for such advertisements are 3s. 6d. a line or part of a line.

RESULTS OF B.C.G. VACCINATION IN JERSEY

By R. N. McKINSTRY, O.B.E., M.D., D.P.H.
Medical Officer of Health,
and
A. S. DARLING, M.B., D.P.H.
Assistant Medical Officer of Health,
States of Jersey

During the autumn of 1949 B.C.G. vaccination was started in Jersey ; by the end of 1952 approximately 11,000 had been tuberculin tested and 8,253 had received B.C.G. Of those who received B.C.G., 7,600 were under 15.

The actual vaccination has caused little trouble. The most serious complaint has been about the persistence and not the severity of the reactions. Some have developed enlarged glands, probably more than we know of. In at least two cases the gland has been removed and sectioned, the pathologist reporting the presence of acid-fast bacilli. As sometimes the enlargement of lymphatic glands appears months after the initial lesion has healed it is not unnatural that a R.S.O. should remove it as he may easily be new to the island and not alert to our B.C.G. activities and so would not connect the gland with the little scar on the arm. A few cases have been off colour for a few weeks, sometimes with slight fever. Nevertheless, it can be said with considerable truth that the reactions have been unimportant.

Two children were infected with tuberculosis at or about the time of vaccination. One was a contact who in spite of orders was allowed to visit his mother who was an open case of tuberculosis and even to sit on her bed, before and immediately after vaccination. He developed a pleural effusion. The other, a little girl, developed tuberculosis meningitis within six weeks of vaccination. An elder sister was found to have bilateral respiratory tuberculosis with cavitation. Both children have responded well to treatment. These children in all probability would not have received B.C.G. if we had adopted the system of test, six weeks' isolation, test, vaccination and another six weeks' isolation before a final test. Nevertheless, in all probability both would have developed tuberculosis. All the expense and labour of isolation would merely have saved two out of over 8,000 from B.C.G. and not from tuberculosis. These cases cannot be counted as failures of B.C.G.—they are those who were infected with tuberculosis before resistance developed.

Out of 8,253 persons vaccinated, two are known to have developed tuberculosis after the usual period required for resistance to develop. One is an adolescent boy who received B.C.G. on November 14th, 1949, and developed tuberculosis with positive sputum in 1952. The other was a nurse in training who was vaccinated with B.C.G. on May 21st, 1950, and developed a small focus in the right upper zone in May, 1951. The focus was detected by means of the routine *x*-ray of nurses. Both of these patients are still under treatment.

Our custom in this campaign has been to do a Mantoux test using 10 T.U. and if the result was negative give 0·1 c.c. of B.C.G. intradermally in the left deltoid region. The vaccine used was supplied by the State Serum Institute, Copenhagen, through the Ministry of Health. It was always used well within the 14 days, usually less than seven days from the date given on the ampoule.

At first we retested all who received B.C.G. six to eight weeks later. Of the first 3,843 persons who received B.C.G., 2,969 presented themselves for retesting with 10 T.U. and 2,958 were positive. That is, they had over 6 mm. induration. Of the 11 negatives, seven were willing to be retested, using 100 T.U., and all were positive. It is surely obvious that in running a mass B.C.G. vaccination campaign all this retesting after vaccination is an unnecessary labour. We now simply examine the B.C.G. lesions 6 to 10 weeks after vaccination and if they are less than 4 mm. in diameter, retest.

Recently we have substituted the jelly test for the 10 T.U. Mantoux test in many cases, especially with young children. We use either the jelly supplied by the State Serum Institute, Copenhagen, or the double strength old tuberculin jelly recently introduced by Burroughs Wellcome & Co. Comparative tests using 10 T.U. intradermally and the two jellies named above percutaneously, have in our hands given almost identical results, the slight difference that exists being in the favour of the jelly test. Two other tuberculin jellies tested at the same time proved to be most unreliable. Positive jelly reactions have been checked in a number of cases by the subsequent use of 100 T.U. intradermally to estimate the risk of "false positives." So far we have found none. The technique we use in the jelly test is light stroking (and it must be light) with flour paper, a small blob of jelly under plaster, remove plaster after 24 hours and wash area, read after four to five days. Pseudo-positive reactions may be produced if the plaster is left on too long or if the dried jelly is not removed by washing.

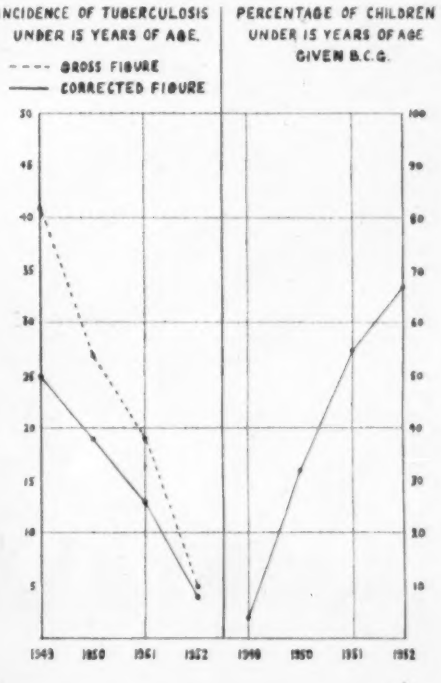
Babies born of tuberculous mothers or when there is an open case of tuberculosis in the home, are isolated until the post B.C.G. tuberculin test is positive. They then return to their parents.

We are thus going our own way. We use either a 10 T.U. Mantoux test or a jelly test and consider them identical. We give B.C.G. if either is negative. We nowadays only retest those with lesions under 4 mm. We give B.C.G. to all new-born babies if the parents consent. Above 75% do consent.

The pediatrician to the Jersey General Hospital recently pointed out that there appeared to be a steady fall in the incidence of tuberculosis in his wards since the institution of our B.C.G. campaign. This led to a careful examination of all the records of tuberculosis available in the General Hospital and Overdale Hospital (that is in the island) of children under 15, for the years 1949 to 1952 inclusive.

FIG. 1

RESULTS OF B.C.G. VACCINATION IN JERSEY



The result was striking. In 1949 there were 25 cases ; in 1950, 19 ; in 1951, 13 ; and in 1952, four. Thus it would appear that the incidence of tuberculosis amongst children under 15 has been reduced to approximately one-sixth of its previous level. (*See Fig.* 1 *on page* 191.)

The broken line in Fig. 1 needs a little explanation. Unfortunately, no arrangements had been made about the standard recording of cases before the B.C.G. campaign started. We obtained all the case histories, *x*-rays, etc., that were available and sorted them first into those we thought were definitely tuberculous and those we considered we should reject as doubtful, and then arranged the remainder according to the year of onset. Some were rejected because they were really readmissions, some because the evidence was regarded as insufficient. We were not consciously biased in this selection for, as already stated, we chose the cases before we arranged them in chronological order but I have added to the graph the broken line to the right which gives the fall before selection. It would appear from this that any unconscious bias we may have had operated against our conscious hopes as the fall in the uncorrected line is much steeper than in the corrected.

The upper set of nomograms in Fig. 2 gives the estimated percentage of children of the total population in each year of age in 1949, 1950, 1951 and 1952 who had received B.C.G. The lower nomograms gives the number of cases in each of the years according to the age of onset. Although we appreciate that the figures are not statistical proof, we are of the opinion that they illustrate a fall in incidence under 15 very clearly.

We have tried to think if any other factor than B.C.G. has been at work to cause this fall with no success.

There has been no change of housing, nutrition or anything of that kind that could account for it. A greater percentage of the milk supply is now pasteurised but as there is no bovine tuberculosis in the Jersey herd that cannot be the cause.

The following quotation is from a paper presented to the Jersey Breed Conference in 1949 by Messrs. T. Le Q. Blampied, F.R.C.V.S., and Albert Messervy, M.R.C.V.S. :—

"In 1834, at a meeting of the Agricultural Society, it was stated that with the help of a States Grant a regularly educated veterinary surgeon had been brought over to the island at a retainer of £40 per annum.

"At a meeting of the Royal Jersey Agricultural and Horticultural Society in 1892, a letter was read from Mr. Peer, of New York, giving the impression that 'Jerseys on the island are subject to tuberculosis.' Col. Le Cornu moved that the President be requested to inform Mr. Peer 'that tuberculosis has never been known to exist amongst our stock.'

"In 1898, in connection with the shipment of cattle to Denmark, the Danish Government sent a veterinary surgeon to supervise the tuberculin test. Of 130 cattle tested, only one cow reacted to the test. This animal was destroyed and a post-mortem examination carried out in the presence of Mr. A. Le. Sueur, a local veterinary surgeon, revealed no tubercular lesions.

"The position still holds good and is confirmed by the tuberculin test carried out in connection with the export of cattle."

The fact is that as far as is known there never has been more than rare, sporadic cases of tuberculosis in the Jersey cow. It was not eliminated by a campaign of test and slaughter ; it was never there and so can have had no effect on the incidence of tuberculosis amongst the human population of Jersey.

The only other possibility is that as the numbers are small it is just a chance variation. To settle that point one would, I suppose, have to find out the incidence under 15 over a long series of years and find what variations have occurred in the past and then calculate the chance of a steady reduction over a period of four years of this magnitude.

I am afraid that the records do not exist from which this calculation could be made but it is significant that the incidence rate in the age group 15 to 30 has remained more or less stationary during the same period, therefore the infection rate probably remained the same throughout. The actual figures for the 15 to 30 group are : 1949, 37 ; 1950, 53 ; 1951, 38 ; and 1952, 35.

Summary

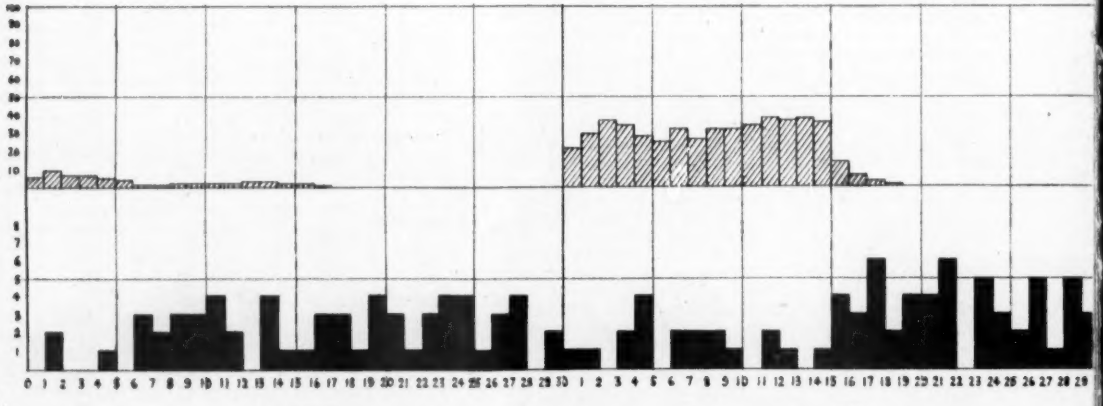
A short description is given of the B.C.G. campaign in Jersey.

A marked reduction in the incidence of tuberculosis amongst children under 15 is shown coinciding with the rise in the percentage of children who have received B.C.G. We believe that the two are related.

FIG

RESULTS OF B.C.G. VA

The shaded nomograms show the total percentages in each a
The solid black nomograms show the numbers of new cases
The figures below the bottom line show the age groups in eac



Acknowledgments

We thank Dr. H. Le V. Dit Durell, pediatrician to the Jersey General Hospital, and Mr. A. C. Halliwell, F.R.C.S., senior surgeon, Jersey General Hospital, for their generous assistance. Finally, we thank all who assisted in the B.C.G. campaign, especially the clerical staff of the Public Health Office for enthusiastic aid and freely given overtime, without which the B.C.G. campaign would not have been possible.

THE PREVENTION OF FOOD POISONING DUE TO PRESSED MEAT PRODUCTS*

An Investigation into their Preparation and Suggestions for Improvement in their Manufacture

By A. I. Ross, M.D., D.P.H.
Deputy Medical Officer of Health, City of Leicester

This paper deals with food poisoning due to one particular food group, but I think it would be well first to say a little about food poisoning in general and more especially about food poisoning due to cooked meat.

Incidence of Food Poisoning

Although it is difficult to estimate the extent of food poisoning in this country before it became notifiable under the Food and Drugs Act, 1938, the number of outbreaks reported to the Ministry of Health in recent years increased up to 1950. In 1951 there was a slight decrease.

Savage and White (1925) were able to publish details of 86 outbreaks occurring in Great Britain between January, 1921, and October, 1923. The average yearly number of outbreaks brought to the notice of the Ministry during the years 1929 to 1939 was 69 (Scott, 1939). From 1939, when 83 outbreaks were reported, there was a considerable increase until 1950 when there were 992 outbreaks and family outbreaks, and 2,987 sporadic cases reported—a total of all incidents of 3,979. In 1951, possibly due to the cool summer, there was a decrease of 16% in all incidents to 3,347. (Reports 1939 to 1951.)

In Leicester, in 1951, nine outbreaks were notified, and in 1952, 11.

* Paper read to the East Midland Branch, Society of M.O.H., May 14th, 1953.

Importance of Meat Dishes as a Vehicle of Food Poisoning

Processed and made-up meat dishes, which include pies, stews, sausage meat, brawn, pressed beef, reheated meat, rissoles and cold meat, have long been recognised as an important vehicle of infection of food poisoning, *e.g.*, being responsible for 20 out of the series of 100 outbreaks reported by Savage and White (1925). In this country at present, they are the most frequent vehicle of the reported outbreaks of food poisoning, in 1949 causing 195 (57%) of the 339 outbreaks and family outbreaks where the food known, or thought to have been responsible, was mentioned, in 1950, 202 (48%) of 435 and in 1951, 114 (49%) of 233 (Reports 1949, 1950, 1951). Meat products are also a frequent vehicle for bacterial gastro-enteritis in America, being responsible for 127 (32%) of 392 outbreaks reported to the U.S. Public Health Service from 1945 to 1947 (Feig, 1950).

Role of Pressed Meat Products as Vehicles of Infection of Food Poisoning

In the group of processed and made-up meat dishes, pressed meat products are an important category, being prepared in a distinctive way and frequently acting as a vehicle of food poisoning. In the 100 outbreaks investigated by Savage and White (1925), pressed meat was the vehicle in eight. Table I (overleaf) gives details for 1951 in respect of the outbreaks and family outbreaks reported to the Ministry of Health where pressed meat and similar products were suspected as the vehicle of infection (Cockburn, 1953).

It will be seen that pressed meat acted as the vehicle in 26. The total number of outbreaks and family outbreaks where the vehicle of infection was known was 233 (Report, 1951), *i.e.*, pressed meat products were responsible for 11%.

Bacterial Causes of Food Poisoning where Meat Products Act as the Vehicle of Infection

Table II (overleaf) (Report, 1951) shows the presumed causal agents in the 114 outbreaks and family outbreaks in 1951 where processed and made-up meat was the medium of infection. Staphylococci and Salmonellae are the commonest responsible organisms and then *Cl. welchii*.

. 2

CCINATION IN JERSEY

ge group of those given B.C.G. since Autumn, 1949.
f active disease in each age group during each year.
1 year.

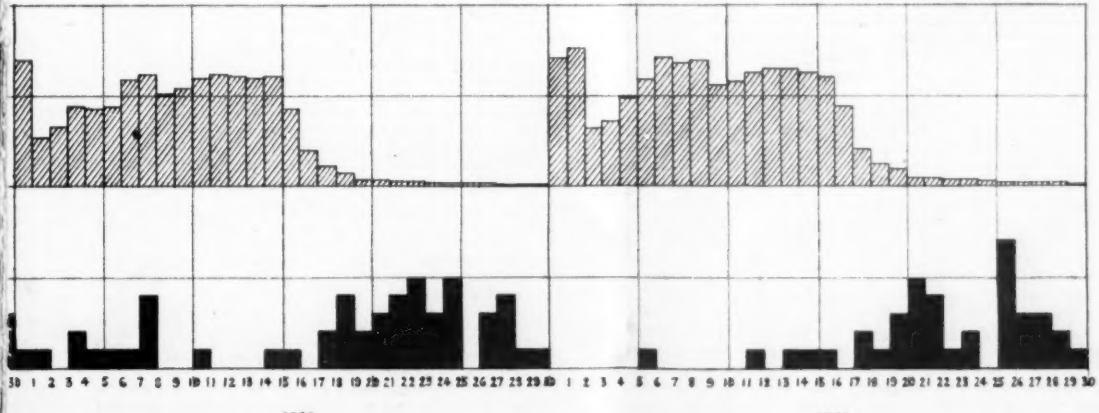


TABLE I

OUTBREAKS AND FAMILY OUTBREAKS WHERE PRESSED MEAT AND SIMILAR PRODUCTS WERE SUSPECTED AS THE VEHICLES OF INFECTION IN 1951

	Presumed Causal Agents					
	Salm. typhi-murium	Other Salm-onellae	Staphylo-cocci	*Cl. welchii*	Un-known	Total
Pressed veal sandwiches ...	1					1
Pressed chicken sandwiches ...		1				1
Cold tongue in aspic		1				1
Pressed beef ...			4		1	5
Pressed pork ...			1			1
Pressed beef and canned pork ...			1			1
Pressed beef and salami					1	1
Pressed meat ...			1			1
Tongue & pressed tongue			5	1	2	8
Ham and tongue roll			1			1
Brawn			2		1	3
Jellied veal ...			1			1
Galantine				1		1
Total ...	1	2	16	2	5	26

TABLE II

OUTBREAKS AND FAMILY OUTBREAKS IN 1951 WHERE PROCESSED AND MADE-UP MEAT PRODUCTS ACTED AS VEHICLES OF INFECTION

Salm. typhi-murium	Other Salmon-ellae	Staphy-lococci	*Cl. welchii*	Other organ-isms	Un-known	Total
12	15	28	16	2	41	114

The variety of organisms isolated from the foods responsible, which includes meat products as well as other foods (the details for meat products not being given separately in the paper), and classified under "other organisms," included aerobic and anaerobic spore bearers, haemolytic and non-haemolytic streptococci, coliform bacilli, enterococci, proteus, and others (Cockburn and Simpson, 1951).

Staphylococcus aureus (coagulase positive) has been referred to repeatedly in recent years as the cause of infection where pressed meats were the vehicle, *e.g.*, brawn (Moore and Topley, 1943), pressed beef (Oddy and Clegg, 1947; Hobbs and Freeman, 1949), lambs' tongues (Hobbs and Thomas, 1948), chicken and rabbit galantine and pressed tongue (Millar and Pownall, 1949). Williams *et al.* (1952) have shown by 'phage typing that the staphylococcus responsible almost always belongs to Group III which is also the commonest group found in the faeces of normal persons.

During the last 10 years it has become clear that a number of organisms which have not been usually considered to be pathogenic can cause food poisoning if given suitable conditions, *e.g.*, those mentioned above in the report by Cockburn and Simpson (1951) and streptococcus, *proteus*, *Bact. coli* and *Bact. aerogenes* (Jordan and Burrows, 1935), *Cl. bifermentans* (Duncan, 1944), and paracolon bacilli (Edwards, 1943; Stone, 1944). In an extensive outbreak of water-borne gastro-enteritis in Leicester, the general heavy bacterial contamination of the water was considered responsible (Ross and Gillespie, 1952). Non-specific organisms were thought to be the cause of an outbreak of food poisoning where shellfish was the vehicle (Logan and Oliver, 1952, and Pilsworth, 1952). In an outbreak in Leicester mentioned below staphylococcus (coagulase negative) and aerobic spore-bearing organisms, were responsible.

Cl. welchii has also recently become incriminated as a cause of food poisoning. Knox and Macdonald (1943), in Leicester, described a number of outbreaks following consumption of midday meals served at institutions where the gravy showed heavy contamination by an anaerobe closely resembling *Cl. welchii*. The subject has recently been fully dealt with by Hobbs *et al.* (1953) who survey 24 outbreaks in the London area due to *Cl. welchii*, the medium of infection almost invariably being a cold or warmed-up meat dish made from meat which has been cooked for two to three hours on the day before it is required and allowed to cool slowly overnight.

Means of Access of Organisms to Food

Staphylococci gain access to food from the hands of nasal carriers, approximately 50% of the population having *Staph. aureus* (coagulase positive) in their noses and about 20% on their hands. Although in this country pigs are frequently infected with salmonellae, and cattle less frequently, outbreaks of infection by salmonellae are usually due to contamination of the product after slaughter. Hobbs *et al.* (1953) state that *Cl. welchii* may gain access to meat from the hands of cooks, butchers, etc., from the invasion of muscles of the animal by intestinal organisms after death and from faecal matter on the floor of the slaughter-house, and from rodents and flies. They found *Cl. welchii* in 2·1% of human faeces submitted to a public health routine laboratory, in 1·7% of faeces from cattle, 14·6% of faeces from rats and mice and in 24·1% of beef specimens examined.

Leicester Experience

In Leicester during 1951 and 1952, of the total 20 outbreaks notified to the Health Department, meat products acted as a vehicle of infection in 12, pressed meat in four, cold pork in one, and other meat products such as gravy, shepherd's pie, mince, and pork pie were the cause in seven. In addition, they were possibly responsible in another one.

The first outbreak due to pressed meat occurred in July, 1951, when 10 persons who had eaten cold pork suffered from diarrhoea and vomiting lasting from half an hour to five hours, two to seven hours after eating pork. The second was six weeks later and affected three people who developed mild diarrhoea lasting from half an hour to four hours, from four and a half hours to seven and a half hours, after eating pressed beef.

There were several defects in the preparation of the foods responsible which was done in the same premises in both cases. After cooking by boiling, the meat was transferred by metal scoops to an unsterile stainless-steel table top, where it drained and was allowed to cool sufficiently to be handled. It was trimmed by hand, and placed in moulds, bones, sinews, etc., being removed. Boiling gelatine was added and the full moulds were covered by metal plates. There were many possibilities for contamination of the utensils. One hour later the moulds were placed in a refrigerator at 38° F. Three days later the meat was sent to a retail shop and sliced on a slicing machine which was not being properly dismantled for cleaning and was never sterilised.

Staph. aureus (coagulase positive) 'phage type 6/7/47/5/54 + was recovered from the pork and from the stools of four of the patients in the first outbreak. In the second outbreak the same 'phage type of staphylococcus was grown from the pressed beef, the nose of the factory worker who placed the beef in moulds, the hands of the shop assistant who sliced and sold the beef (his nasal swab showed 'phage type 70) and the blade and guard of the machine used to slice the beef. The same individual had placed the pork and the beef in the moulds in both outbreaks. When swabbed at the time of the first outbreak his nose showed 'phage type 52B and his hands type 70.

In the third outbreak on December 15th, 1951, two members of the same family suffered from vomiting on several occasions and diarrhoea lasting five and eight hours respectively, four hours after eating pressed ox-tongue. The tongue, after having been soaked in brine for a week, had been boiled for three hours, removed from the water by a scoop and skinned in a sink. It was then placed in an enamel pail, gelatine solution poured in and a china plate put on top. After cooling at room

temperature for one hour it was placed in a refrigerator. Neither the sink in which it was skinned, nor the pail used for pressing the tongue, nor the plate used to cover it, had been sterilised. *Staph. aureus* (coagulase positive) 'phage pattern 47/54, was recovered from the nose and hands of the butchers who prepared the tongue, from remains of the tongue in the patients' house and in the butcher's shop, and from scrapings from the machine used to slice the tongue before sale.

The fourth outbreak happened on May 30th, 1952, when four members of one family, four hours after eating pressed tongue, suffered from vomiting and diarrhoea lasting 24 hours. The tongue had been kept in pickle for three weeks, then boiled, trimmed by hand on an unsterilised wooden table, placed in an unsterilised mould, covered, and put into a refrigerator.

Staph. aureus (coagulase positive) 'phage type 42D, was recovered from the hands of the butcher who prepared the tongue (his nose yielded a scanty growth of staphylococcus (coagulase negative)) from two samples of tongue remaining over from the meal, from the mould in which the cooked tongue had been pressed, and from the tray into which the tongue had been emptied from the mould.

Although pressed meat was not the vehicle of infection in the outbreak of three cases due to a heavy contamination of cold pork by staphylococcus (coagulase negative) and aerobic spore-bearing organisms, it is thought to be worth while mentioning (see above). The pork was cooked on August 24th, 1952, and stored in the larder. The weather was warm. Some eaten by two people on the 25th produced no symptoms, but that eaten by three on the 27th, *i.e.*, three days after cooking, caused vomiting and diarrhoea three and a half to eight and a half hours afterwards.

Investigation of Premises in Leicester where Pressed Meat Products are Prepared

The investigation was planned following the first two outbreaks of food poisoning mentioned above, when inspection of several other premises where pressed meat products were prepared showed that the methods of preparation were defective in many ways. It was, therefore, decided to investigate the preparation of these meat products, *e.g.*, brawn, tongue, and pressed meat, which are eaten as sold without further cooking.

Method of Investigation

The 20 premises in Leicester where these products are cooked were visited, usually with the District Sanitary Inspector, who, knowing the proprietor or manager, helped in the necessary friendly approach. All the butchers visited cooperated readily and fully.

All visits were paid by prior appointment when cooked meats were being prepared. A thorough inspection was made of the premises, paying special attention to their construction and cleanliness, the types of utensils and cutlery used, and the method of cleaning, their cleanliness and sterilisation, the cleanliness of the personnel and the methods used in cooking the meat and in transferring it to moulds. A further visit was paid to the shop on the next day or later to see the meat removed from the moulds prior to sale. Five bacteriological specimens were taken at different stages from each premises visited.

A report was prepared in a form suitable for punch-card analysis, the information being grouped in 69 main headings with additional subsidiary ones.

Usual Method of Preparing Cooked Pressed Meat Products in Leicester

Most of the shops visited were small, family businesses, the cooking taking place at the rear of the shop.

Usually after a variable period in pickling solution, the meat, tongue, etc., is cooked in large boilers until tender. The meat is removed using a scoop or some other implement and is usually placed on a table where it drains and remains until cool enough to handle, when it is trimmed, bones and gristle, etc., being removed, and the meat packed in metal moulds. Gelatine solution is added, and usually some form of cover is placed on the mould and kept in place by clips or weights. After cooling at room temperature for a variable time, the moulds are placed in the refrigerator where raw meat is also kept. Next day or later the mould is taken out of the refrigerator; the cover removed and the meat extracted by passing a knife round the inside of the mould and inverting it.

Results of Survey

Amount of Meat Cooked.—The approximate amount of meat processed by each butcher weekly is shown in Table III.

TABLE III

Under 56 lb.	2
56 lb. < 1 cwt. ...	10
1 < 5 cwt.	5
5 cwt. < 1 ton ...	2
1 < 10 tons	1
	20

Three of the butchers are large producers, the others being much smaller. Some cook only occasionally.

Premises.—All were registered under Section 14 of the Food and Drugs Act, 1938, and none was therefore entirely unsuitable. Various defects were, however, present. In three the walls, and in five, the ceilings were dirty. In two the floor was dirty, and in one of these it was made of rough brick, cracked and difficult to clean. Floor drainage was poor in two, the floor draining across the pavement to the open street gutter. Ventilation was poor in two shops and refuse disposal unsatisfactory in eight, the bones, etc., which awaited collection being placed in sacks or uncovered rubbish bins.

Personnel.—Table IV gives details of cleanliness of personnel and the protective clothing worn.

TABLE IV

	Yes	No
Hands—periodic inspection by senior member of staff	0	20
Constant hot and cold water for hand washing	17	3
Soap	17	3
Nailbrush	11	9
Head covering	0	20
Evidence of smoking in preparation room ...	2	18
	Clean	Dirty
Towels	18	2
Overalls	16	4

That there were no arrangements for inspection of hands by a senior member of the staff was to be expected as in most of the premises the owner or manager did the cooking and pressing. The frequent lack of nailbrushes and the absence of head-covering in all premises visited are noteworthy.

Boilers.—The boilers used for cooking the meat were all satisfactory. In one instance the meat was cooked in the boiler wrapped in cloth, which allowed it to be withdrawn easily.

Utensils.—The utensils used for removing the meat from the boiler were all clean and were sterilised or otherwise as summarised in Table V.

TABLE V

Satisfactory		Unsatisfactory	
Boiling more than five minutes	1	Hypochlorite inadequate	1
		Hypochlorite adequate but then contaminated by touching article ...	1
		No sterilisation	8
		Scalding	7
		Boiling less than five minutes	2
	1		19

Adopting strict criteria of sterilisation, only one of these could be said to be entirely satisfactory, the utensils being boiled for 10 minutes.

Tables or Other Articles on which Meat was Placed before Filling Moulds.—In 16 premises the meat was transferred to a table, and in three to an intermediate container (large

sieve, enamel bath, or aluminium basin). In one the meat was placed directly into the mould. Eight of the table tops were wooden and four of these were dirty and difficult to clean, having cracks between the boards. The other tops were made of enamel (three), stainless steel (three) and aluminium (two).

In six cases hypochlorite was used in an attempt to sterilise the table top or intermediate container and in one case it was scalded.

Cutlery.—The cutlery used to trim the meat before placing it in the moulds and in some cases to transfer it to the moulds, was in all cases clean. Table VI shows the methods of sterilisation adopted.

TABLE VI

Satisfactory		Unsatisfactory	
Boiling more than five minutes	2	Nil	10
Hypochlorite adequate ...	1	Hypochlorite inadequate	1
		Scalding	5
		Boiling less than five minutes	1
	3		17

Eleven were entirely unsatisfactory and only three satisfied the usual medical standards.

Use of Hands.—In most cases the meat was touched by hand and in many instances handled repeatedly, the actual filling of the mould being done by hand, the knife and fork being subsidiary.

Moulds.—The moulds were made of the materials shown in Table VII.

TABLE VII

Aluminium alloy—rough surface ...	10
Aluminium alloy—smooth surface ...	2
Tin	3
Enamel rough	1
Enamel smooth	1
Stainless steel	3
	20

Six had seams, making them difficult to clean.

Apart from one, which was dirty and greasy, the methods of cleaning and cleanliness were satisfactory.

The methods of sterilisation are shown in Table VIII.

TABLE VIII

Satisfactory		Unsatisfactory	
Boiling more than five minutes	3	Nil	10
Hypochlorite adequate ...	1	Hypochlorite inadequate	1
		Scalding	4
		Boiling less than five minutes	1
	4		16

The storage arrangements were satisfactory in 16 premises and unsatisfactory in four, in three of which the moulds had been adequately sterilised but owing to storage or handling afterwards, they became contaminated.

The capacity of the moulds varied, as shown in Table IX.

TABLE IX

2 < 4 pints	4
4 < 8 pints	7
1 < 2 gallons	7
2 < 3 gallons	2
	20

The two largest were enamel buckets. The size of the mould is important because the larger the volume of meat the longer it takes to cool.

Covering of Moulds after Filling

In four the meat in the moulds was left uncovered. In the other 16 various materials were used, in some cases being of the same metal as the mould and specially made and shaped to fit. Wood was used twice. In neither case were they sterilised. One was clean, the other greasy from repeated use without cleaning. The liquid added to the meat after placing in the mould came into contact with the covers. In another instance a sterile lid was placed on the table top before putting on the mould. In one premises, greasy half-bricks, which were rarely cleaned and never sterilised, were used as weights on top of the lids. When these bricks were applied they pressed the meat and almost invariably the liquid jelly came round the edges of the lid and touched the brick.

Sterilisation.—The methods of sterilising the lids are shown in Table X.

TABLE X

Satisfactory		Unsatisfactory	
Boiling more than five minutes (one of these placed on table) ...	3	Nil (including one grease-proof paper)	10
Hypochlorite adequate ...	2	Scalding	1
		Boiling less than five minutes	—
	5		11

Total 16

Transfer of Meat from Boiler to Mould.—In all cases the meat was removed from the boiler after cooking at a temperature high enough to ensure sterility. It was then (with the one exception mentioned above, where the meat was filled directly into the mould) placed on a table or utensil where it stayed for varying times in different premises. The times the last portions of meat remained on the tables, etc. —before placing in moulds—are given in Table XI.

TABLE XI

	Minutes					
	Less than 15	15–30	30–45	45–60	60–90	90–120
Time last batch of meat stayed on table or in utensil before placing in mould	8	6	2	—	2	1

Total 19

The temperatures of the last portions of meat placed in a mould are given in Table XII.

TABLE XII

	Centigrade								
	100°	100–90°	90–80°	80–70°	70–60°	60–50°	50–40°	40–30°	30–20°
Surface temp. ...	1	1	2	4	5	–	5	–	2
Interior temp. ...	1	1	4	3	5	5	–	–	1

Total 20

Preparation and Use of Gravy or Gelatine Solution.—Usually the gravy poured on the meat in the moulds was prepared by dissolving powdered or leaf gelatine in hot water and boiling the solution. In two cases the gelatine was not boiled. In another two the gelatine was allowed to cool to body temperature before pouring into the mould. In another gelatine was not used, but the water and gravy in which the meat was cooked was used repeatedly for six to eight weeks, when it was thrown away. On the occasion of the visit this last method, when the moulds were emptied the day after filling, gave a product of semi-liquid consistency.

The temperatures of the gelatine solutions when poured into the moulds are shown in Table XIII.

TABLE XIII

	Centigrade								
	100°	100–90°	90–80°	80–70°	70–60°	60–50°	50–40°	40–30°	30–20°
Temp. of gelatine when poured into mould	2	2	6	1	4	2	1	–	2

Total 20

The low temperature of two will be noted.

Covering of Meat and Placing in Refrigerator.—The times elapsing before the meat was covered and before putting in the refrigerator or coldroom, are given in Table XIV.

TABLE XIV

	Not covered	Minutes					Hours				
		<15	<30	<45	<60	<90	<3	<4	<5	<6	<9
Time elapsing before :	4										
(*a*) Covering		9	1	2	–	1	2	–	1	–	–
(*b*) Placing in 'frig. ...		3	7	–	1	2	2	–	2	2	1

The temperature of four of the refrigerators or coldrooms in which the meat was stored was higher than 10° C.

Emptying of Moulds.—An unsterile knife was used to ease the meat from the mould in 12 instances.

Comment on Inspection Results

These results show the unsatisfactory methods used. To summarise, several of the premises themselves were unsatisfactory in some respects. Few butchers sterilised their equipment adequately. Some of the arrangements for storing equipment were unsatisfactory. Two of the moulds were too large necessitating too long a time for the meat to cool. Four of the moulds were not covered after filling with meat, and several others were not covered satisfactorily. In some cases the cooked meat was exposed too long before being placed in the moulds and there was undue delay in cooling. The gelatine solution added to the meat was too cool in two cases and had not been boiled in two. Twelve butchers used unsterile knives to remove the meat from the moulds.

Bacteriological Results

The five samples for bacteriological examination were taken as follows :—

(1) Gravy or gelatine solution immediately before adding to the meat in the moulds.

(2) Gravy from the first mould immediately it was filled—mainly from the surface near the edges of the mould.

(3) Gravy from the last mould immediately it was filled—mainly from the surface near the edges of the mould. (At four visits only one mould was filled.)

(4) A swab (moistened in Ringer's solution) from an empty mould immediately before it was filled—seams and any rough or chipped surfaces were swabbed.

(5) Jelly from meat immediately it was removed from a mould prior to sale—taken from the surface of the meat.

Bacteriological Technique

Each sample of jelly and gravy was melted at 37° C. for five minutes, and emulsified in 10 ml. quarter Ringer's solution. The following media were then inoculated :—

Incubated at 37° C. for 18 hours :

(*a*) 5% blood agar.
(*b*) Salt cooked meat.
(*c*) Robertson's cooked meat.

Incubated at 37° C. for 48 hours :

(*d*) McConkey broth, single strength.

Each swab was inoculated directly on 5% blood agar, McConkey agar and then rubbed up in quarter Ringer's solution. The resulting suspension was inoculated into salt cooked meat and Robertson's cooked meat.

After incubation the blood agar plates were examined for the extent and nature of the bacterial growth. Tubes of McConkey broth showing both acid and gas were plated to confirm the presence of coliform organisms, and submitted to the 44° C. test to differentiate faecal *Bact. coli* type I from other coliforms.

Subcultures on blood agar from the salt cooked meat were examined after further incubation at 37° C. for 18 hours for *Staphylococcus aureus.*

The tubes of Robertson's cooked meat, after incubation, were heated for 30 minutes at 100° C. in a steam steriliser, and then reincubated for a further 18 hours. Blood agar plates, inoculated from these cultures were incubated anaerobically and examined after 18 hours for the presence of heat resistant *Cl. welchii.*

The results are summarised in Table XV

Staph. aureus (coagulase positive) was obtained from specimens from two different premises, *Strep. viridans*—two, *Strep. faecalis*—four, *Proteus*—one, *Bact. coli*—two, coliforms—two, Staphylococci (coagulase negative)—two, *N. catarrhalis*—one, Micrococci—five, and *B. subtilis*—three. Heat resistant *Cl.welchii* were not isolated from any specimens.

TABLE XV

	Estimate of bacterial growth					Bacteria obtained								
	Sterile	Scanty	Mod.	Heavy	Not done	Proteus	Bact. coli	Strep. faec.	N. cat.	Micrococci	Strep. vir.	Coliforms	B. Subt.	Staph. (C–)	Staph. (C+)
Gravy before adding to meat ...	17	3							1						
Gravy from first batch ...	11	8	1						1	3	1	1	1		
Gravy from second batch	10	5		1	4					1	1			1	
Swab from empty mould	11	5	3	1				4		3	2		2	1	
Gravy when mould opened	10	5	4	1		1	3	1		3	1				2
				Total ...		1	3	5	2	10	5	1	3	2	2

In several premises the same organism was grown from more than one specimen. This accounts for the differences in the totals above and those given in Table XV.

In only two cases were all specimens sterile. In five others only scanty bacterial growth was obtained from one or more specimens, the only organisms isolated being either micrococci or *B. subtilis*. In the remaining 13, where various organisms were isolated, there were obvious defects in the technique of meat preparation.

The findings, both on inspection and on bacteriological examination, show the unsatisfactory methods that are used in the preparation of meat products and make one wonder why outbreaks of food poisoning from this source are not much more common.

Review of Recommendations by Other Workers on the Preparation of Meat Products

The Report of the Manufactured Meat Products Working Party emphasises the need to reduce handling of ingredients to the minimum. For example, in paragraph 135 the Report states "Manufacturers of meat products should continue to seek ways of minimising the extent to which ingredients and products are handled," and the suggestion is made of using a scoop for filling meat pies and to transfer sausage mix from one counter to another. In paragraph 136 the Report recommends "that a code of practice should lay special emphasis on reducing the handling of meat products and ingredients to a minimum." When discussing the processing of tongue and other pressed meats, they point out the dangers of handling such articles after cooking (paragraph 146). In paragraph 147 they recommend that tongues which have to be skinned after cooking should then be boiled for a further five minutes to destroy surface contamination.

Paragraph 148 states: "The final cooking should take place after the tongue or other meat has been placed in the mould in which it is to be pressed; manufacturers with facilities for cooking by steam will have no difficulty in doing this and others using open-cookers should, whenever possible, modify their practice to secure the same result. At all times contact with the hands after cooking should be reduced to a minimum."

They recommend that the rules set out in paragraphs 147-149 should be embodied in a code of practice.

The essential points of their recommendations are that tongues and pressed meats should either be finally cooked in the mould in which they have been pressed, or cooked for five minutes after skinning and trimming. Apart from recommending that handling should be avoided, recommendations are not made as to how this should be done.

The booklet "Hygiene in Meat Products Factories," published by the Food Manufacturers' Federation, Inc., follows closely the Working Party's recommendations. Unfortunately, the advice on the preparation of tongues is not followed in its entirety, the booklet stating "tongues should be skinned as hot as possible with a minimum of handling and placed in the container at once. Similarly, pressed meat should be packed with the least possible delay and, in the case of open packed tongues and pressed meats, they should then be heated in a steam chest for a time commensurate with the size of the pack," *i.e.*, no recommendations are made suitable for the small producers without a steam chest.

The Ministry of Health publications on food poisoning in England and Wales in 1949 and 1950 (Cockburn, 1950; Cockburn and Simpson, 1951) do not give methods of how pressed meats should be prepared. The 1950 Report states "it is for the catering trade to realise their responsibilities in this matter and to devise new methods for the preparation of food in large quantity."

In the paper read to the Royal Sanitary Institute Congress in 1950 by Gerrard (1950) on the Meat Products Industry, the need to avoid handling cooked meats is not mentioned. The phrase "in the case of briskets, etc. . . . they should be placed into the container and pressed as soon after cooking as it is possible to handle [*sic*] them," shows the dangerous methods used in the trade. In the discussion which followed no mention was made of the danger from handling meat.

Hobbs and Freeman (1949) make recommendations on the processing of cooked meats but do not advise against putting the meat on tables (they recommend that table tops be sterilised with hypochlorite) and do not give precise recommendations for using implements when trimming the cooked meat.

Following the investigation of an outbreak of food poisoning due to *Staph. aureus* in brawn, Moore and Topley (1943) recommend that :—

(1) Handling of the brawn should be avoided, in particular mixing of the chopped pigs' heads with the savoury gelatine mixture, should be carried out with suitable instruments.

(2) All utensils should be sterilised as far as possible, preferably by boiling.

(3) The final mixture should be boiled for half an hour, filled into sterilised tins and then cooled as rapidly as possible and kept in a refrigerator until offered for sale.

Apparently these methods did not find favour with the butcher who finally decided to discontinue the preparation of the brawn altogether.

Following the investigation of a widespread outbreak of staphylococcal food poisoning where the gelatine glaze on cooked sausage loaf was responsible, the extensive and detailed recommendations made by Allison, Hobbs and Martin (1949) include :—

(1) A "no-touch" technique where the hands of the operative never come in contact with the food.

(2) Wooden utensils, etc., and the tops of wooden tables and trolleys should be replaced by stainless steel. These, together with tank and mould, should be cleaned and sterilised at the end of each day's work. [During preparation, cooked food would continue to be placed on table tops.]

Topley and Wilson (1946) state that a method little short of a surgical aseptic technique may have to be adopted to prevent infection of ingredients.

Suggested Methods of Processing Pressed Meat

When we found that the methods used for preparing processed meat were so unsatisfactory, our next step was to attempt to evolve a simple technique which could be used by the smaller butcher to give good results both from the bacteriological point of view and also from that of the butcher who has to sell the product, *i.e.*, the meat must be packed without too large spaces containing jelly, and it must slice without wastage on a slicing machine.

In the case of the large firm the best method is undoubtedly that recommended in the Report of the Manufactured Meat Products Working Party, *i.e.*, final cooking by steam, but this has several difficulties and we think the method too expensive for the small producer.

We have evolved an aseptic technique which is being used successfully by three Leicester butchers and is being adopted by others.

Method

The meat is cooked in the usual way or placed in the boiler in a large collander. All moulds, lids, knives, forks, etc., and a small bucket or jug, are boiled or steamed for at least 10 minutes. The butcher wears clean protective clothing, including a washable head-covering and a gauze mask covering the nose and mouth. After 10 minutes the bucket or jug is withdrawn from the boiling water—housewives' wooden laundry tongs costing about 3s. 6d. have proved useful for this purpose, the gripping end having first been sterilised by boiling—and filled with boiling water to which a measured amount of hypochlorite, to give 100 parts per million of chlorine, is added. The other knives, forks, etc., are then placed in the bucket with the handles projecting. A mould is removed using the tongs, inverted, shaken and placed on a table. The meat is then filled directly into the mould and if it is necessary to trim the meat, remove bones, etc. this is done on a tray previously boiled, or in the collander if one has been used.

(*Concluded on page* 200)

After each instrument is used it is returned to the hypochlorite solution.

Boiling gelatine solution is poured into the mould and a sterile cover applied using the laundry tongs to handle the cover when it is made of sheet metal without a handle, otherwise holding the cover by the handle, care being taken that the part that is to come into contact with the meat or jelly does not touch anything. The filled mould is then taken straight to the coldroom or refrigerator if this is large enough not to suffer a significant rise of temperature when a hot article is placed inside. If the refrigerator is small the meat is cooled by placing the mould in a sink filled with cold water for 10 to 20 minutes, the water running constantly and overflowing.

When the meat is of poor quality or small with bones, as in the case of tongues which have to be skinned and boned, the meat can be partly cooked, trimmed, recooked to sterilise, and then placed in the moulds, using the aseptic method described.

The use of a mask is desirable but not essential. It prevents contamination of cooked meat and utensils by organisms from the nose and mouth and of the hands by staphylococci, which may be in the nose. It reminds the butcher that the preparation of pressed meat is a very special process.

Bacteriological checks have not so far shown pathogenic organisms present in the jelly, meat or moulds.

The method has been readily accepted by the butchers when it has been found to produce a satisfactory pack and not to increase significantly the time taken on the work.

It can be recommended for the small producer who cooks only once or twice a week.

Summary

1. Statistics of outbreaks of food poisoning in England and Wales where meat and pressed meat products acted as a vehicle are given.

2. Four outbreaks in Leicester, due to *Staph. aureus* (coagulase positive) in pressed meats are described.

3. The results of a survey of the method used to prepare cold meats in Leicester are given.

4. In many cases the methods used were unsatisfactory.

5. Pathogenic organisms or organisms indicating the possibility of contamination by pathogenic organisms were recovered from specimens from 13 out of 20 premises examined.

6. A method for the satisfactory preparation of meat products is described.

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